DC Power Systems

Technology and Challenges for complete DC power systems approach

GSMA-IFC Green Power for Mobile Working Group 29-30 January 2014, Lagos, Nigeria

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Outline

Overview of Controllis

Industry Needs

Technology Brief

Product Technology Roadmap

Deployment Case Studies

Questions

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Does your monthly site fuel bill feel like this?

Controllis Vision

1. **Green power solutions are not magic**

2. **They use technology easily available today**

3. **Green solutions can reduce fuel spending immediately**

Overview of Controllis

Controllis designs, develops, and manufactures remote controllers, communications systems and generators.

Our remote controllers monitor mission critical assets, such as; generators, water installations, defence and power systems.

Our DC generators are marketed under the Quiet48 brand. Controllis generators provide clean DC power for telecoms operators and renewable power installations at significantly lower fuel consumptions than their AC counterparts.

Controllis is based in the UK with HQ in Cambridge, a Manufacturing facility in Norfolk, England, and Design Offices in Scotland and the Home Counties. The company Directors are from Telecoms, Defence and F1 sectors.

Company owned by Management Team, High Net Worth Investors and $1.5bn T/O Aerospace and Defence Company.

Controllis Cambridge HQ



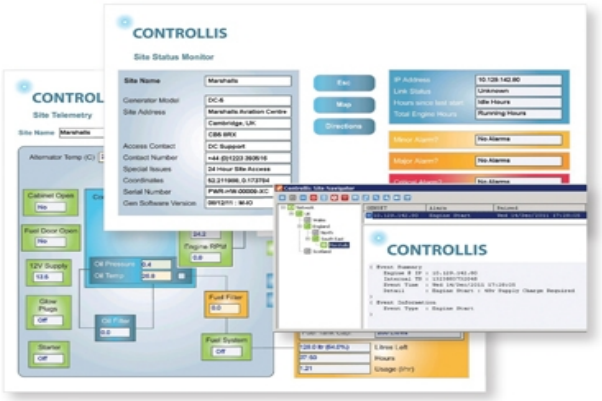


Controllis Software Design Office, Scotland.

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Overview of Controllis – Product Range

Remote Management Software

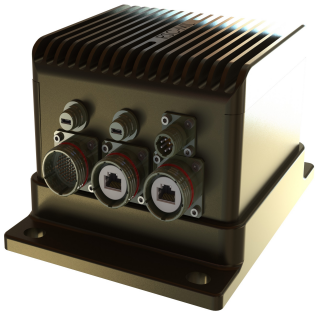


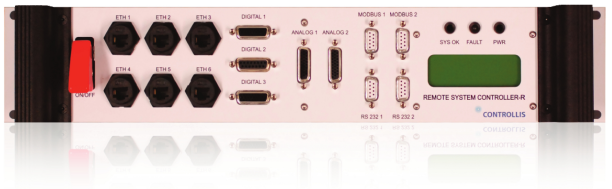
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Remote Control and Communications Systems

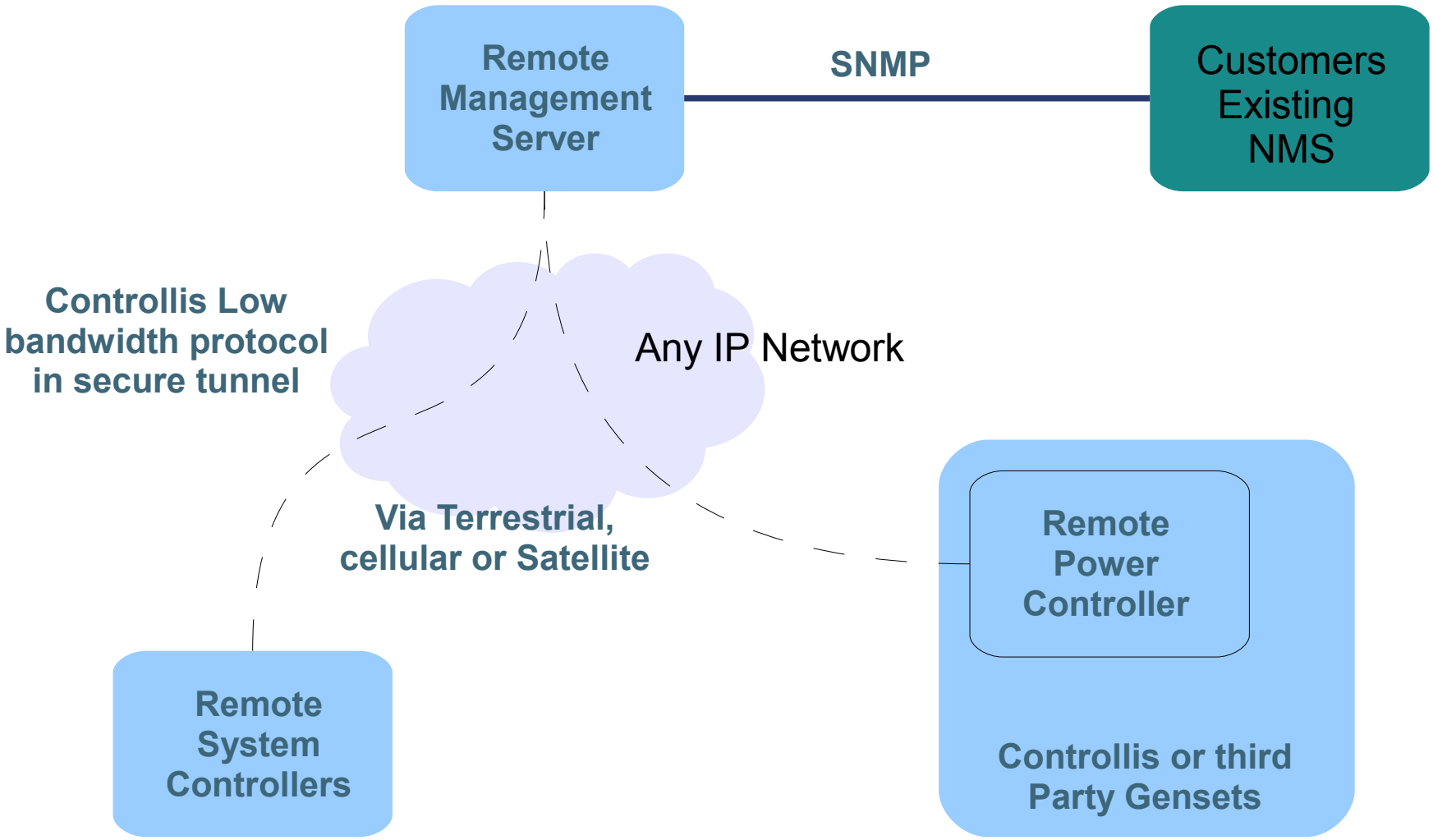




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Overview of Controllis – High Level Architecture



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Mobile Industry Needs - Site Power

Fuel Efficiency

Reliability

Security

Simple Quick Installation

Hard Economic Factors
Directly affecting operators profits

Low Environmental Impact

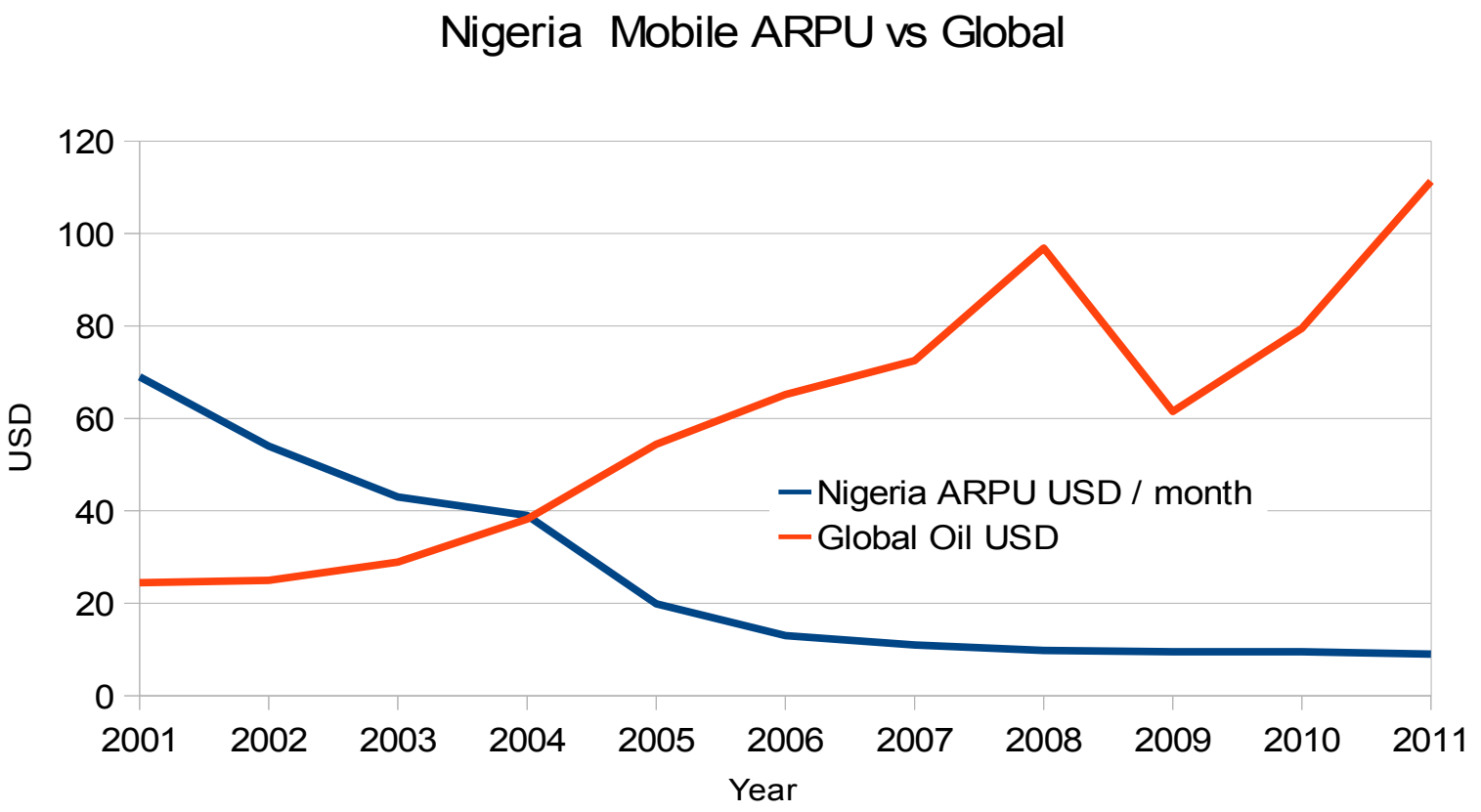
Local Community Buy In

Important Social Factors
Indirectly affecting operators position

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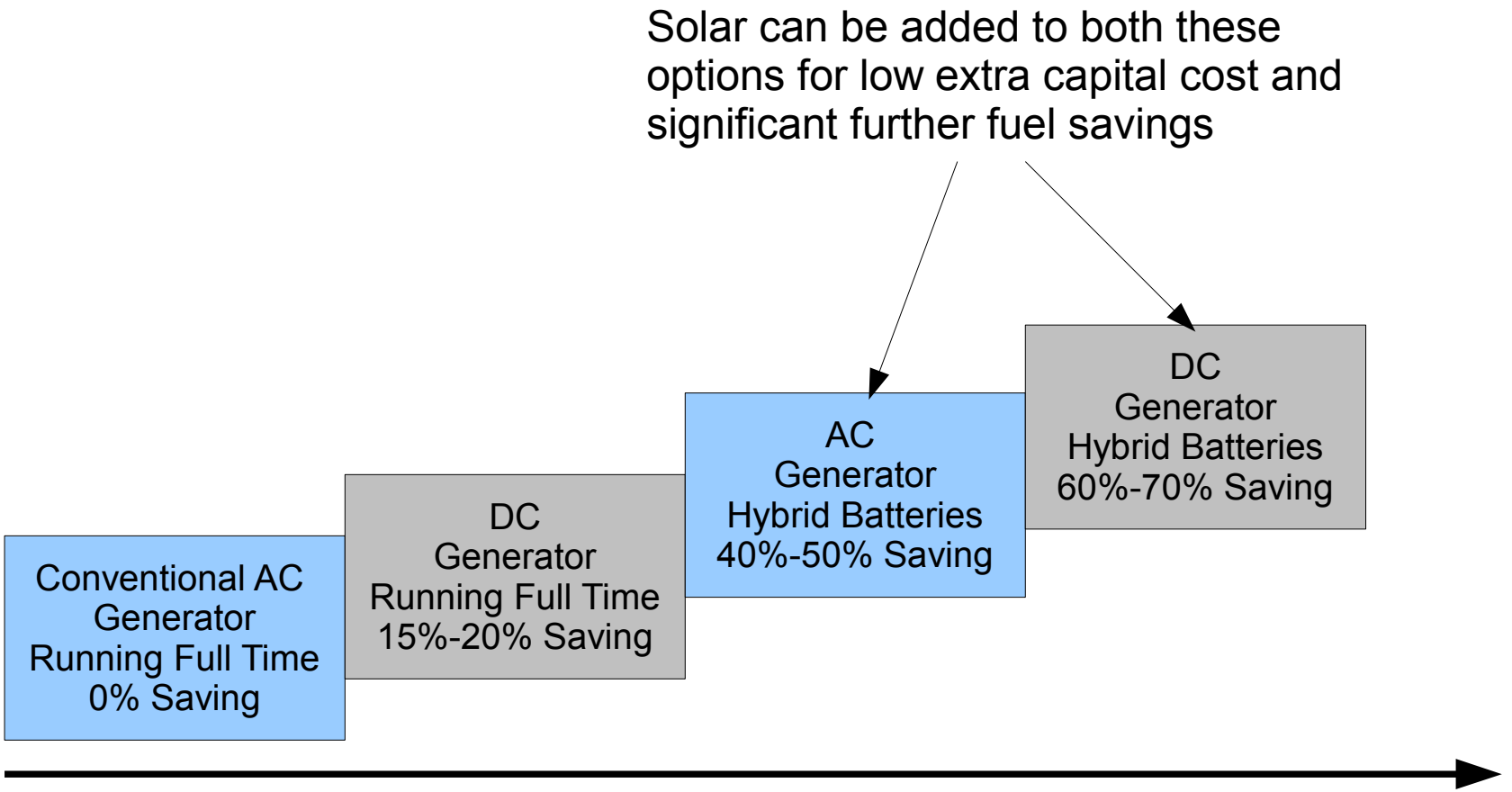
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Fuel Efficiency – Why its an issue



Sources: ARPU strategy Analytics, Oil Prices US EIA

Fuel Efficiency – Options



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Reliability, Security, Ease of Installation

	Drivers
Reliability - reduced site visits - lower maintenance costs - fewer outages, smaller staff	- Larger multi cylinder engines* - High quality engine manufacturer - In-depth remote engine supervision - High quality built-for-purpose control system
Security - lower loses through capital theft - lower losses through fuel theft - lower loses through vandalism	- Strong physical security - Electronic site monitoring - Electronic fuel monitoring - Site CCTV in “bad” sites - Countermeasures in “very bad” sites
Ease of Installation - less time to get sites on air - fewer staff	- Plug-and-play site commissioning - Basic connections for power and ground - Pre configured monitoring with GPS

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Environmental Impact & Community Buy In

Drivers

Low Environmental Impact

- lower carbon emissions
- availability of development funds
- can use in marketing

- More efficient DC power generation
- Quieter generator operation

Local Community Buy in

- opportunity to win subscribers
- availability of development funds
- lower loses through theft & vandalism
- can use in marketing

- Provision of some local power
- Quieter generator operation

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A Controllis All DC Approach

Benefits

- Lower fuel consumption
- Fewer site components
- Smaller site foot print
- In-depth remote monitoring
- Improved site security
- reduction in theft

Challenges

- Legacy Air Conditioning
- Legacy AC site requirements
- Provisions for test equipment
- Provisions for community power

Provided the Challenges can be addressed the benefits result in a lower total cost of ownership

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Addressing the Challenges

Air Conditioning

- General trend is towards outdoor BTS with free cooling, however still some sites with AC requirement.

- Manufacturers such as DC Airco produce -48V DC air-conditioners specifically for telecoms sites

Pictured DC 12500 B



AC Power for Test Equipment etc.

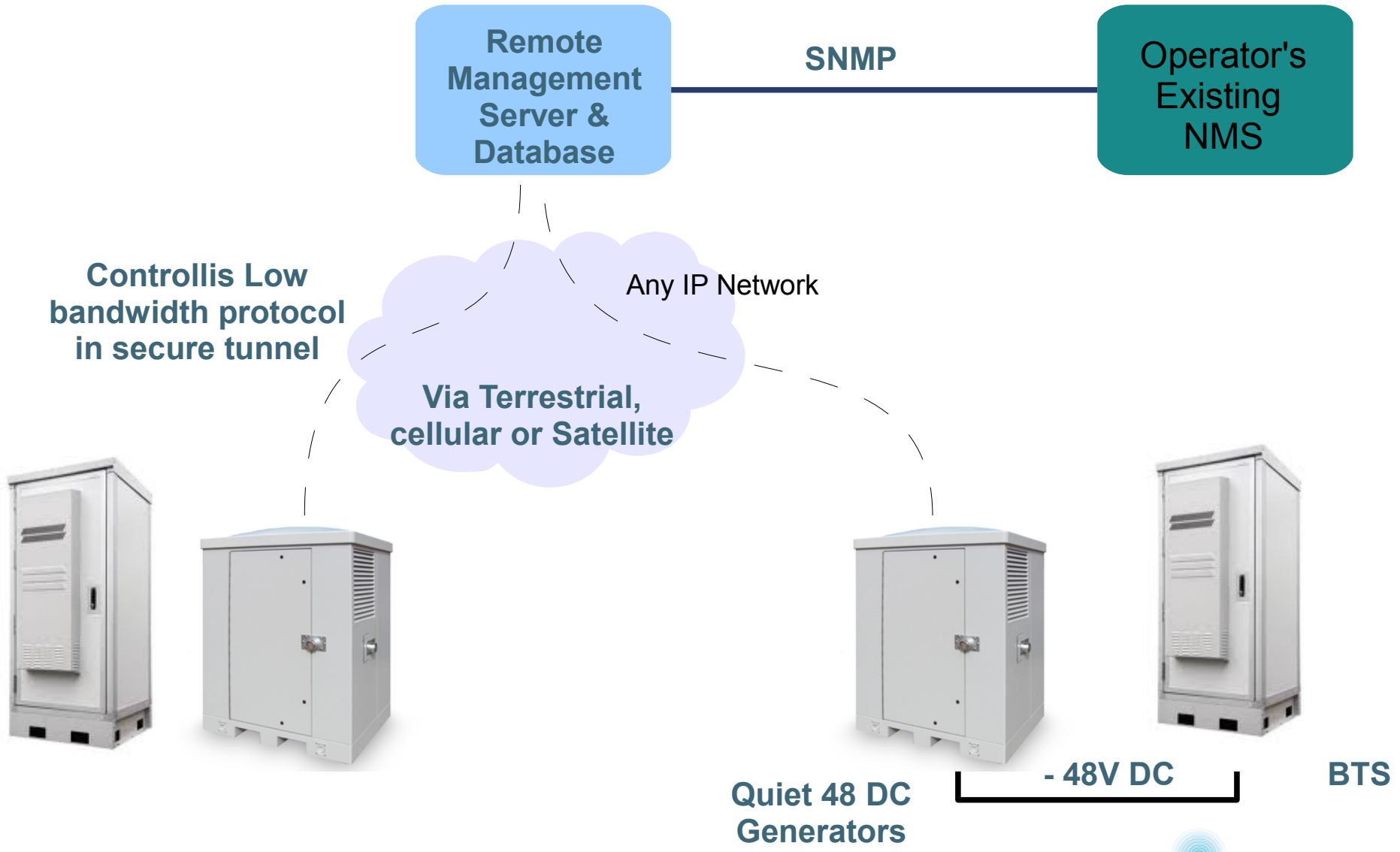
- Can be easily and inexpensively provided by inverters, available from a number of manufacturers

- In hybrid systems mains provided through inverter is backed up by the large battery bank so more reliable than conventional mains

Pictured Victron Pheonix 48/1200/230



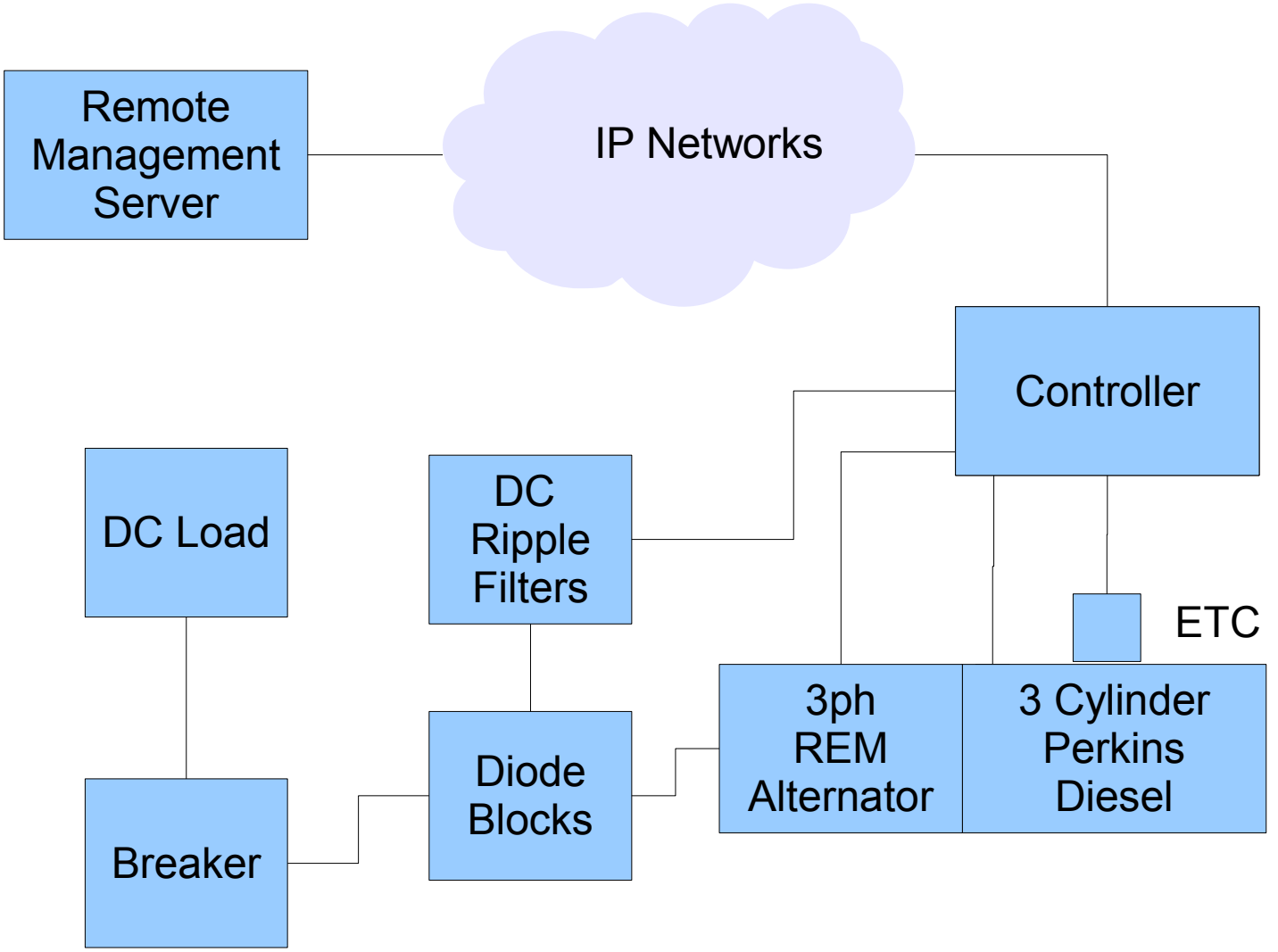
Controllis Quiet48 Generators – 5, 7 and 12 KW



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Controllis Quiet48 Schematic

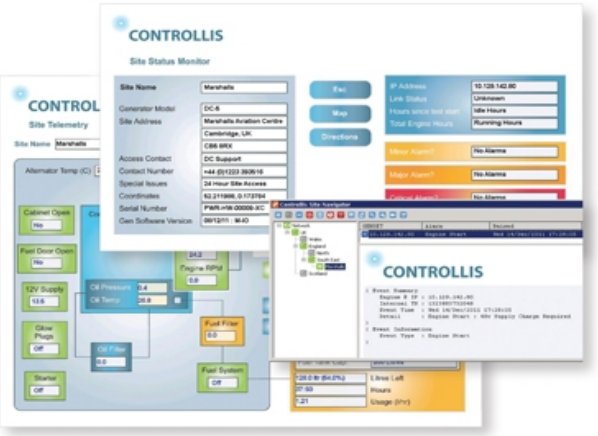


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Remote Management Server

The Remote Management Server performs a number of key roles within the Controllis remote control system product environment, these roles include:



Remote element provisioning

Alarm monitoring, recording and alerting (via visual, audio, SMS and email, NB SMS is also able to be autonomously initiated by individual Remote System Controllers)

Maintenance event and history recording

Remote site heartbeat monitoring

Predictive maintenance scheduling

Video, Imagery and data recording from remote sites

Remote link data security and encryption pairing

Facilitating the use of non fixed IP address SIMs

Aggregating multiple data streams

Each RMS monitors up to 8,000 remote generators

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Remote Power Controller: Inside each Controllis Generator

The Remote Power Controller performs a number of functions inside the Controllis DC generators:

Controlling engine start, stop and speed
Monitoring and controlling 48V and 12V battery charge
Monitoring fuel and oil levels
Monitoring engine temperatures and filter conditions
Monitoring generator and site security
Logging events
Relaying alarms

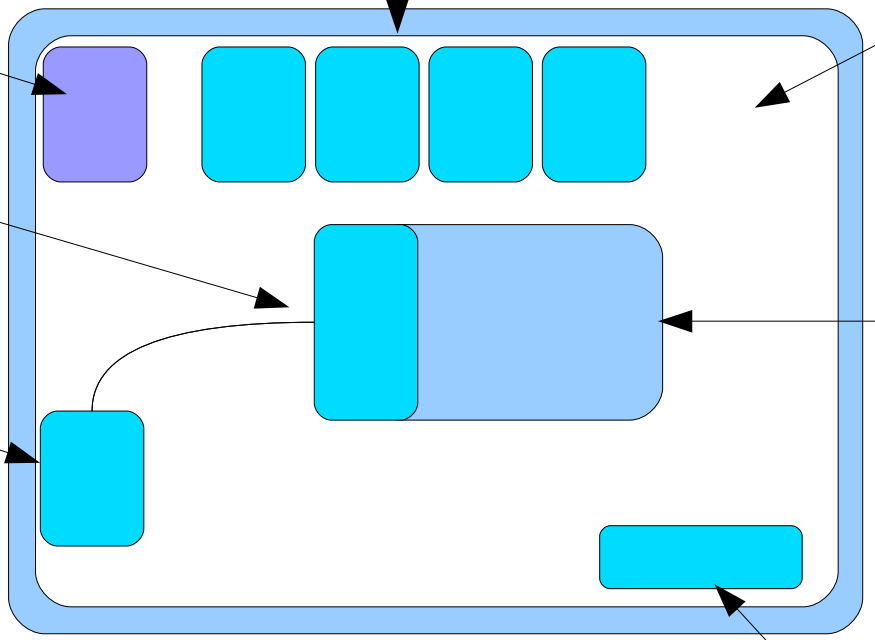


The RPC has an internal UMTS/GPRS modem and Communicates securely with the Remote Management Server via the modem or an Ethernet Interface

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Inside Controllis Quiet48 DC Generators



Internal 48V battery Bank
Up to 500 AH Lithium Ion battery pack various options on lead or sodium

Optional Solar PV charge Controller Up to 3kW x 2

Optional Internal Fuel tank with leak protection and alarms. Electronically monitored fuel level

3 Phase Brushless Alternator

3 cylinder Perkins Diesel Engine. 1,000 hour service Interval

Internal Diode Block & Power Filter

High Performance Acoustically Insulated Aluminium, Composite and Steel Enclosure ~47 dBm at 7m

Controllis Electronic Engine And Battery Charging Control and Monitoring System with UMTS/GPRS Comms

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Key System Differentiators

Generator efficiency – **Combination of high efficiency permanent magnet flywheel mounted alternator and variable speed controller yields outstanding fuel consumption rates.**

Overall system security – **All our communications are within very secure tunnels, enclosures are monitored continuously, fuel is monitored in real-time, IP CCTV is optional.**

Sensors, Logging and fault prediction – **The system has been designed to provide warnings of potential problems before they arise. This can reduce maintenance burden and avoid damage to the engine.**

Comms Integration – **Our Remote Controllers incorporate built-in multi-band UMTS/GPRS modems with GPS. SMS to specific service personnel can be centrally configured and rapidly updated to reflect shift changes and absences for sickness etc.**

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Quiet48 DC Generators site with no mains power



Optional Solar Panels

Controllis Quiet 48 DC Generator

Comms Equipment

Optional Additional 48V Battery Bank

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African Deployment Example 1

5kW Generator Hybrid Operation



Generator was installed to reduce fuel consumption on South African site

Operating in Hybrid mode with 1200 AH Lead Acid battery bank

AC Equipment on site fed via Inverter

76% fuel savings and 80% reduction in maintenance visits

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African Deployment Example 2

5kW Generator Continuous Operation Temporary Installation prior to mains power being installed

Generator was rapidly installed to allow the site to be run for about 4 months before the mains was installed

DC Feed directly into the Batteries at the bottom of the Outdoor BTS cabinet

Installation is 2 hours from arrival on site

Fuel consumption 0.9 litres per hour compared with 1.2 litres per hour from a new AC generator on the same equipment with same load 25% lower consumption



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Thank You

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